

REMARKS

Applicant has carefully reviewed and considered the Office Action mailed on November 4, 2002, and the references cited therewith.

Claims 6, 7, 8, 9 and 10 are amended. Claims 1-19 now pending in this application.

§112 Rejection of the Claims

Claims 6-10 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Claims have been amended solely to provide proper antecedent basis. The scope of such claims is not intended to have been affected.

§102 Rejection of the Claims

Claims 11-13 were rejected under 35 USC § 102(b) as being anticipated by Hooper et al. (U.S. 6,146,458). This rejection is respectfully traversed. Applicants have reviewed Hooper et al. in detail and nowhere is it seen any teaching of alternating beams as described by the Office Action. The language of Hooper et al. cited in the Office Action is:

“The vacuum chamber 10 is also provided with a first supply conduit 20 which, in accordance with the present invention, extends into the vacuum chamber so that an outlet 22 of the first supply conduit 20 is adjacent to and faces the surface of the substrate S upon which epitaxial growth is to take place. The first supply conduit 20 is adjustably mounted relative to the chamber 10 so that the relatively small distance x between the outlet 22 of the first supply conduit 20 and the epitaxial growth surface of the substrate S can be varied during the epitaxial growth period. As can be seen from FIG. 1, the longitudinal axis of the first supply conduit 20 is perpendicular to the plane of epitaxial growth.

The first supply conduit 20 is used to supply ammonia which is precursor of the nitrogen required in the epitaxial growth process. Because of the positioning of the outlet 22 of the first supply conduit 20 relatively close to the substrate S, a relatively high ammonia vapour pressure is localised at the surface of the epitaxially growing material whilst enabling an ultra-high vacuum environment within the vacuum chamber 10 to be achieved by the pump 14 communicating with the vacuum chamber 10 via the exhaust conduit 16.”

No teaching of alternating beams as claimed is described. Claim 11 recites “applying beams of remote plasma RF nitrogen alternately with the beams of Al to produce the layer of AlN of desired thickness.” This element is clearly lacking in the references, and claims 11-13

should be allowed. In addition to the lack of teaching of alternating beams, the language of Hooper et al. referenced in the Office Action does not teach the use of remote plasma RF nitrogen, rather, it recites "The first supply conduit 20 is used to supply ammonia which is a precursor of the nitrogen..." Thus, at least two elements are lacking and the rejection should be withdrawn.

Yet a further element lacking in Hooper et al. is the actual provision of "the layer of AlN of desired thickness." as claimed in claim 11. While Hooper et al. claims the formation of a layer of Group III nitride, it only describes the growth of a GaN. A reference to Al is found at Col. 6 lines 6-10: "The apparatus further comprises a pair of independently operable, shutter-controlled effusion cells 24 and 26 which contain sources of elemental gallium and another element (e.g. aluminum or dopant) which may be required during the epitaxial growth procedure." Further, it is clear that the aluminum is only added to a GaN layer: "for incorporation into the epitaxial growth material as necessary" Col. 6, lines 56-62. No teaching of the formation of an AlN layer as asserted in the Office Action was found.

Claim 13 adds "delaying a predetermined amount of time between the alternating beams." This was cited as being inherent to Hooper et al. Inherency is referenced in MPEP § 2112: "In relying upon the theory of inherency, the examiner must provide basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art," citing Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original). The Office Action contains no assertion that delaying a predetermined amount of time necessarily flows from the description of Hooper et al. Therefore, a prima facie case of inherency has not been established, and the rejection should be withdrawn. Further, Applicant found no teaching in Hooper et al. that beams are alternating. Absent such teaching, one possible assumption is that the beams are applied at the same time. Thus, the rejection should be withdrawn.

§103 Rejection of the Claims

Claims 12 and 14-19 were rejected under 35 USC § 103(a) as being unpatentable over Hooper et al. This rejection is respectfully traversed because each and every element is not taught by Hooper et al.

Claims 12 and 14-16 depend from claim 11, and it has been shown that there are elements from claim 11 missing from Hooper et al. As such, Hooper et al. does not show each and every element, and the rejection should be withdrawn. Further, claims 12 and 14-16 recite specific parameters that are not described in Hooper et al., such as claim 12: "alternately applied for approximately two seconds"; claim 14: "the delay is also approximately two seconds"; and claim 15: "wherein the desired thickness is approximately 500 Angstrom."

Claims 17 through 19 also contain elements not found in Hooper et al. As indicated above, Applicant found no teaching of a delay between applying beams of Al and beams of RF nitrogen. As such, this rejection should also be withdrawn.

Claims 1-10 were also rejected under 35 USC § 103(a) as being unpatentable over Shealy et al. (WO 01/13436) in view of Yamaguchi (Yasuhiro)(JP 60195978) and Hooper et al. This rejection is respectfully traversed. Applicant reserves the right to swear behind Shealy et al. at a later date.

Applicant respectfully submits that the Office Action did not make out a *prima facie* case of obviousness because the references are not properly combinable and even if combined, do not show each and every element of the claims.

A factor cutting against a finding of motivation to combine or modify the prior art is when the prior art teaches away from the claimed combination. A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path the applicant took. *In re Gurley*, 27 F.3d 551, 31 USPQ 2d 1130, 1131 (Fed. Cir. 1994); *United States v. Adams*, 383 U.S. 39, 52, 148 USPQ 479, 484 (1966); *In re Sponnoble*, 405 F.2d 578, 587, 160 USPQ 237, 244 (C.C.P.A. 1969); *In re Caldwell*, 319 F.2d 254, 256, 138 USPQ 243, 245 (C.C.P.A. 1963).

Yasuhiro et al. is stated in the Office Action as teaching "to form AlN using MBE with alternating beams of Al and remote plasma RF nitrogen (see col. 5, lines 51-64). While the assertion of such teaching is also traversed, Hooper et al. actually teaches away from forming such layer on a HFET. The substrate in Hooper et al. is actually heated to approximately 750 degrees C (col. 6, lines 25-30). One range of between 200 – 1500 degrees C is indicated as possible, but 550 – 850 degrees C is preferable. As indicated in the present application, high temperatures adversely affect the HFET. Page 2, lines 21-26: "The deposition is performed at

approximately 150 degrees C....At temperatures about or higher than 300 degrees C, melting may occur, damaging the integrity of the HFET.” Thus, reading Hooper et al. would discourage someone of average skill in the art from attempting to form an AlN layer on an HFET as claimed. Hooper et al. appears to work best at temperatures significantly higher than those taught in the present application. This further indicates that there could be no reasonable expectation of success in making the combination.

The Office Action must provide specific, objective evidence of record for a finding of a suggestion or motivation to combine reference teachings and must explain the reasoning by which the evidence is deemed to support such a finding. *In re Sang Su Lee*, 277 F.3d 1338, 61 USPQ2d 1430 (Fed. Cir. 2002). The Office Action stated “it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Shealy et al. with the combined teaching of Yamaguchi and Hooper et al. so as to reduce the surface effects responsible for limiting both the RF current and breakdown voltages of the devices,” which is a mere conclusory statement of subjective belief. Applicant respectfully submits that the Office Action has not provided objective evidence for a suggestion or motivation to combine the references.

Yasuhiro is stated in the Office Action as applying AlN 8 to the top surface of a field effect transistor. The abstract of Yasuhiro indicates that it “is formed as a protective film.” It does not support the subjective reason to “reduce the surface effects responsible for limiting both the RF current and breakdown voltages of the devices,” which was indicated as the reason for combining the references cited in the Office Action.

It is clear that the references are not properly combinable. While many elements that may appear similar are found in the references, only the roadmap provided by the current application provides a suggestion to combine. Using the current application as such a roadmap is the use of impermissible hindsight, and the rejection should be withdrawn.

Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612-373-6972) to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.


Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, Washington, D.C. 20231, on this 28th day of March 2003.



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